

① Solve for x

$$(a) \frac{800}{100 - e^{\frac{x}{2}}} = 50$$

$$(b) \ln \sqrt{x+2} = 1$$

$$(c) \ln(x+1) - \ln(x-2) = \ln(x)$$

② Expand $\ln \left(\frac{(x^2+3)^2}{x \sqrt[3]{x^2+1}} \right)$

$$\textcircled{1a} \quad 50 = \frac{800}{100 - e^{\frac{x}{2}}}$$

$$\frac{50(100 - e^{\frac{x}{2}})}{50} = \frac{800}{50}$$

$$16 = 100 - e^{\frac{x}{2}}$$

$$-84 = -e^{\frac{x}{2}}$$

$$\ln(84) = \frac{x}{2}$$

$$2\ln 84 = x$$

$$\boxed{x = 8.862}$$

$$\textcircled{1b} \quad \ln \sqrt{x+2} = 1$$

$$e = \sqrt{x+2}$$

$$e^2 = x+2$$

$$e^2 - 2 = x$$

$$\boxed{5.389 = x}$$

$$\sqrt{x^2 - 1}$$

$$\neq x - 1$$

$$c. \ln(x+1) - \ln(x-2) = \ln x$$

$$\cancel{x+1} - \cancel{x+2} = x$$

$$3 = x$$

$$\ln\left(\frac{x+1}{x-2}\right) = \ln x$$

$$\frac{x+1}{x-2} = x$$

$$x^2 - 3x - 1 = 0$$

$$0 = x^2 - 3x - 1$$

$$x = 3.303, -0.303$$

$$1 = x^2 - 3x$$

extraneous

Expand

$$\ln \left(\frac{(x^2 + 3)^2}{x \sqrt[3]{x^2 + 1}} \right)$$

$$1 = x^2 + x$$

$$0 = x^2 + x - 1$$

$$\ln(x^2 + 3) - \ln(x) + \ln(x^2 + 3) - \ln(\sqrt[3]{x^2 + 1})$$

$$2 \ln(x^2 + 3) - \ln(x) - \ln(\sqrt[3]{x^2 + 1})$$

$$2 \ln(x^2 + 3) - \ln(x) - \frac{1}{3} \ln(x^2 + 1)$$

$$\log_a a^x = x$$

$$\frac{d}{dx} \log_a a^{\sin x} \rightarrow \frac{d}{dx} \sin x = \underline{\underline{\cos x}}$$

$$\frac{d}{dx} e^x = e^x$$

$$\frac{d}{dx} e^u = e^u \frac{du}{dx}$$

$$\frac{d}{dx} a^x = a^x \cdot \ln a$$

$$\frac{d}{dx} a^u = a^u \ln a \frac{du}{dx}$$

$$\frac{d}{dx} \ln x = \frac{1}{x}$$

$$\frac{d}{dx} \ln u = \frac{1}{u} \cdot \frac{du}{dx}$$

$$\frac{d}{dx} \log_a x = \frac{1}{x \ln a}$$

$$\frac{d}{dx} \log_a u = \frac{1}{u \ln a} \cdot \frac{du}{dx}$$

$$\frac{d}{dx} \ln(x-3) = \frac{1}{x-3} \quad \text{All } \mathbb{R} \quad \cancel{x \neq 3}$$

$$x > 3$$

Exploration p. 174

Hw Sect. 3.9

1-28 (10), 52, 53

$$72 - 30(0.98)^t$$

$$\downarrow$$

$$0 - 30 \left(\frac{d}{dt} (0.98^t) \right)$$

$$-30(0.98^t \cdot \ln 0.98)$$